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ABSTRACT

This paper reports on a study developed to determine what experts in the area of educational research perceive as the basic skills and knowledge areas that one who has successfully completed a one-semester graduate course in educational research should possess. A decision was made to conduct a Delphi study to identify these skills and knowledge areas. To establish a panel of experts, the membership of a special interest group of professors of educational research was asked to nominate experts to participate in the round of questionnaires. A description is given of the Delphi process and how, in this case, it synthesized diverse opinions into a consensus. A discussion of the findings notes that the top five skill and knowledge areas found to be essential were concerned with knowledge of research-oriented periodicals and critical evaluation of reports in those periodicals which involves understanding the concepts of internal and external validity. The questions asked in the study and their ranking in importance by the panel are presented, and a copy of the first round questionnaire is appended. (JD)

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Desirable Skills and Knowledge Outcomes for an Introductory Educational Research Course: A Delphi Study

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Desirable Skills and Knowledge Outcomes for an Introductory Educational Research Course: A Delphi Study

A number of authors of introductory texts in educational research state in the preface to their books that their aim is to prepare stulents to become consumers of research. Consequently, considerable attention is given to procedures on how to analyze research approaches, how findings may be generalized, and how the rationale for a study may be justified--in other words, how to critically evaluate a research report. Others view the course as utilitarian, leading to a research project, usually a master's thesis. Still others perceive the course not only as an introduction to the research process but also as a prerequisite to a statistics course or an advanced educational research course or seminar. Although course syllabi detail the objectives for such courses, they tend to be rather general, and instructors even in the same department who have responsibility for the course have been known to diverge from a common, department-adopted syllabus.

There exists, apparently, a diversity of practices with regard to the actual content taught in graduate level courses in introduction to educational research, despite the fact that stated goals and objectives as well as content in many commonly adopted textbooks reflect much homogeneity.

Purpose

This study then, was developed to determine what experts in the area of educational research perceive as the basic skills and knowledge areas that one should possess who has successfully completed a one-semester graduate course in educational research. A decision was made to conduct a Delphi study to identify these skills and knowledge areas.

The Delphi technique is a method of arriving at a consensus from a group of experts without bringing the respondents together. In essence, according to Barnette, Danielson, and Algozzine (1978), it is a "debate between anonymous experts." The Delphi research methodology originated in the early 1950s to predict the impact of an atomic bomb attack on the United States (Linstone & Turoff, 1975). A reliable consensus from a group of experts answering a series of questionnaires was the ultimate objective of "Project Delphi." The questionnaires were intermingled with opinion feedback throughout the series. A consensus was reached regarding which industrial site the Soviets would attempt to fire upon and how many atomic bombs it would take to destroy the site (Linstone & Turoff, 1975). Since its inception, the Delphi research methodology has been used in the United States, Western Europe, Eastern Europe, and the Far East (Linstone & Turoff, 1975). Dodge and Clark (1977) suggested that through use of the Delphi Technique the instructional developer along with content experts can generate objectives for instructional materials. They documented its use in goals, objectives, curriculum, and campus planning.

There are a variety of procedures that may be applied to the Delphi technique. The modified Delphi technique, utilized in this present study, includes the following procedures (Barnette, Danielson, & Algozzine, 1978, p. 67):

1. An instrument regarding primary issues of concern is developed.
2. The instrument is distributed to the panel of experts.
3. Feedback of the results is provided to the respondents.
4. The experts are asked to respond again by revisisng their opinions if their response falls outside the majority range of scores for that particular response or to explain why they choose not to revise a minority opinion.
5. This procedure of questioning, providing feedback, and responding by revising is conducted a number of times until a consensus is formulated by the experts.

There are several advantages to using the Delphi technique. By using this procedure, it is possible to have a committee of experts resolve an issue regardless of the place of residence of the experts. The panel members never have to be face-to-face as in ordinary committee work. Since this procedure is accomplished through the answering of questionnaires (opinionnaires in this study), distance between the experts is no problem. Also, the panel members, during the process, do not know the identity of other experts; therefore, bias is held to a minimum. This method helps to ensure the validity of the results. Possible bias that might develop in a face-to-face confrontation is thereby eliminated. As a matter of fact, Udinsky, Osterlind, and Lynch (1981) suggest that the individuals needed may represent diverse backgrounds with respect to experience and expertise.

According to Linstone and Turoff (1975), if the following questions can receive a positive answer, there is justification for using the Delphi technique:

1. Will the problem benefit from subjective judgments on a collective basis?

2. Do the experts have diverse backgrounds?

3. Can the individuals interact without meeting in a face-to-face exchange?

4. Are frequent group meetings unacceptable?

5. Will anonymity be assured?

Because the answers to all of the above questions were positive in relation to their utilization in this study, the decision was made to employ the Delphi technique to determine skills and knowledge areas for a graduate introductory course in educational research methodology.

The Delphi procedure is more akin to the inductive constant-comparative, grounded theory orientation (Glaser & Strauss, 1967; Strauss, 1987) than it is to the traditional, scientific, hypothetico-deductive approach. As such, parts of the design of the study must evolve with data collection rather than be preplanned. Since experimental random sampling procedures do not readily lend themselves to the Delphi technique, validity is grounded primarily in a well-planned sampling procedure. Greater concern is with panel selection as has evolved with use of the technique over time (Dodge & Clark, 1977).

The factors of feedback, assessment of group judgment, opportunity for revision, and anonymity of the participants are all a part of the structured communication process of the Delphi technique (Linstone & Turoff, 1975). Although one integral aspect of the Delphi procedure is anonymity, demographic information was requested for reasons which will be explained later.

Because the Delphi technique has been used so extensively in recent years (an ERIC review produced over 100 studies in education alone during the 1980s) a small exemplary number have been briefly reviewed here to demonstrate that the technique can be appropriately implemented to establish curriculum bases as Dodge and Clark (1977) have suggested.

A Delphi study in curriculum development by Weaver and Connolly (1988) discussed the importance of linking training evaluation to the processes of design and implementation. The Delphi method elicited the recommendations of experts on the content of a meaningful and timely course of study.

Grissom and Cochran (1986) used the Delphi technique to establish 38 competencies involved in practical teaching skills for use with hearing-impaired students.

A study by Coates (1986) identified components and reached expert consensus on knowledge, attitudes, and behavior appropriate for teachers of terminally ill children.

The Delphi technique was used by Stone (1984) to identify 24 outcome standards for secondary marketing education.

A study by Ernest (1982) identified 69 educational technology competencies perceived by 50 experts in media and/or teaching to be related to teaching effectiveness in an Alabama teacher education program.

Swinton and Bassett (1981), using Delphi, identified the competencies of effective speech communication/drama teachers.

A study by Chaney (1972) sought to develop a rating scale for evaluating student teachers' skills of business subjects.

Method

To establish a panel of experts, the membership of the American Educational Research Association: Special Interest Group Professors of Educational Research was asked to nominate a panel. A basic assumption was that a panel through this process can be appropriately chosen "and is competent to render the judgments required" (Udinsky, 1981, p. 37). At this point probably it is wise to note the difference between "expert" and "panelist" as defined by Sackman (1978, p. 51):

> In passing, it should be noted that the term panelist is a misnomer in the Delphi context. Panelists usually communicate directly and exchange opinion with each other, primarily in a face-to-face setting. With Delphi, we have respondents, not panelists, because communication is strictly with the questionnaire, not with other people. Moreover, all responses are filtered through the intermediary of the Delphi director or his representative before reaching anyone else. There is no interactive discourse deserving of the name panel in Delphi procedures. Respondents really represent a noncommunicating nongroup, linked primarily by remote statistical feedback.

Despite this criticism by Sackman, characteristically members of a Delphi group are referred to as panel members.

In this study content and face validity derive from hierarchies of expertise. Expertise is inferred from overt active membership and participation in a national professional organization (in this study that group consists of 130 members of the American Educational Research Association Special Interest Group: Professors of Educational Research). The SIG membership group was asked to nominate five persons considered to be experts in the field of educational research. They were allowed the privilege of nominating themselves since a basic assumption in the study was that those who actually teach an introductory course are in a position of specialization (experts) and can be relied upon to nominate peers whom they consider to be experts as well.

Of the 130 SIG members, 80 responded by nominating from 1 to 5 persons. Thirty-one persons received multiple nominations. These were selected to become panel members. Of this number 10 indicated that they were unable to participate in the study thereby leaving 21 who agreed to become panel members. The final panel included one self-nominated member who had multiple nominations from others as well. No one person was selected who was nominated only by himself/herself. Of the 21 panel members 10 are members of SIG: Professors of Educational Research; all gave permission for their names to appear in the final report, and they were assured that in no case would their responses to any of the three Delphi Rounds be associated with any particular individual. Their names appear alphabetically listed in Appendix A. In answer to the question by Sackman (1975, p. 7), "Is the choice of experts random or is it

selective?", the answer obviously is "selective." While Udinsky, Osterlind, and Lynch (1981) suggest a panel should possibly include an entire group, or a randomnized stratified sample, it would be impossible to take a random sample (stratified or otherwise) of everyone who has conducted an educational research study.

The next step called for the formulation of an instrument. In this case, Todd and Reece (1987) conducted a study to determine the extent to which a graduate introductory course in educational research was (1) helpful to students in other graduate courses they took later, (2) helpful to them as consumers of research in reading research reports published in journals, monographs, books and other media, and (3) helpful to them in their jobs after having completed the course. Of 693 former students who were mailed opinionnaires, 535 responded by indicating 12 categories in which the course had been helpful. Because 340 of the 535 indicated that the course had been helpful to them in their jobs, a second study was conducted by Todd and Reece (1988) which identified 20 specific ways in which the course was job-related.

From the lists of skills and knowledge areas found helpfpul in these two preliminary studies and from examination of the content areas of current texts in educational research, a list of 77 skills and knowledge areas was formulated. This procedure stands in contrast to the statement by Ayers (1969, p. 149) that "... it is a safe guess that the framers of the questions can to some degree guide the trend of the answers." Questions in this study would, of course, be skills and knowledge areas identified by alumni and textbooks authors.

Consequently, in Round I which was mailed on November 15, 1988, panel members were asked to indicate whether they considered a particular skill or knowledge area to be "Essential," "Important," "Useful," or "Unimportant." These terms were defined on the first page of Round I for the panel members in order to gain uniformity in the decision process. (See instructions on page one of sample opinionnaire in Appendix C).

Upon receipt of Round I, panel members were requested to add to the list of skills and knowledge areas any that they thought should be included in a research course. This produced 32 additional items, plus 1 more which was added by a panel member during Round II. In addition, four "double-barrelled" questions were split into parts a and b (items 36, 41, 47, and 68) by various panel members. These additions produced a total of 114 items.

Each item is displayed twice--once in Appendices C and D in their original numerical sequence, and again rank ordered within consensus categories in Tables 1 through 6. Where consensus was achieved, the tally comprising the consensus is displayed; where consensus was not achieved category tallies are shown. Item 83 in Table 7 is a special case where only one item fell into the "Unimportant" category.

Using Cronbach's alpha, reliability on the original 77 items in Round I when independence of observations existed was found to be .95. Subsequently, reliability was calculated for the items added by the panel after they first appeared on the opinionnaire during Round II. Cronbach's alpha for the added items was .92. Thus, responses to all items on the opinionnaire reflected high internal consistency.

Round III also produced suggestions for combining some items which, in some panelists' opinions, represented duplications in concepts which had been clouded by diverse terminologies. Such comments have been included along with minority defenses in Table 6 where results are later presented.

When Round II was distributed on January 4, 1989, the respondents saw the results of Round I, which included the majority responses (where they existed) and the respondents' answers for each item. A majority response was defined as the single integral of the ratings ("Essential," "Important," "Useful," or "Unimportant") that was chosen by more than 50 percent (11 or more) of the respondents. That majority tally was enclosed in a square (This is illustrated later in the results, Table 7). In the case no majority existed within a category, two adjacent categories were combined if the one added adjacent integral on the rating scale then summed to 16 or more (75 percent) of the responses; in that case the two were enclosed by a rectangle. Outliers, that is, those whose responses fell outside the square or rectangle were asked to provide written justification for their responses, a procedure described as conventional by Sackman (1975). Before mailing Round II to one of the experts, his/her response to each skill was indicated by a red dot over the integral containing that expert's response from Round I. If the expert's response fell outside of the majority range, he/she was asked to either change or defend the minority opinion. In this manner, a consensus regarding each skill and knowledge area would be reached. Also, on the Round I opinnionaire, experts were asked to add any

skills and knowledge areas that they felt were essential and had been omitted from the list. The origial list of 77 items and those added by panel members may be seen in Appendices C and D.

On February 15, 1989, Round III was mailed to the panel members. Identical procedures that followed Round I were utilized. Majority responses were tallied. Respondents' opinions were again indicated by a red dot and they were again asked to change their position or to defend minority positions.

As this study progressed beyond two rounds it was fortunate that no panel members decided to drop out--a well-known hazard of the Delphi technique as described by Sackman (1975). However, during Round III a few of the panelists gave instructions to keep their same responses and defenses from Round II, and one panel member gave instructions to move his/her responses to the majority in all cases with no further defenses to be offered. It was also observed that a majority of the panel did not notice and/or respond to the newly-added final Item 110 during Round III. It might be inferred that factors of time and/or interest had come into play by the time the final round was received.

Findings

As can be seen in Table 1, 38 Skills and Knowledge Areas were found to be "Essential" by the panel; that is, they received that designation 11 times or more. It is interesting to note that the top 5, which received 100 percent agreement, are concerned with knowledge of research-oriented periodicals in one's field, and critical evaluation of reports in those periodicals which involves

Table 1. Rank Ordered Skills and Knowledge Areas Deemed ESSENTIAL by Experts (Consensus = Majority of at least 11 within the Essential category)

Original Item Number	Total N = 21 Tally
5. Can identify questions/problem statements that do not lend themselves to the scientific method of analysis	21
61. Understands the concept of internal validity	21
64. Understands the concept of external validity	21
72. Has developed a familiarity with research-oriented periodicals in his/her own field or area of interest	21
73. Can critically evaluate a research report	21
1. Understands what constitutes research	20
2. Understands what a scientific study involves	20
13. Can read journal articles and research reports with understanding	20
16. Understands what is involved in the Experimental Method of solving a research problem	20
63. Has an understanding of how design arrangements can reduce threats to internal validity	20
71. Has an understanding of the basic ethical and legal considerations in conducting research	20
3. Can state a problem or question in such a way that it is amenable to the research process	19
6. Demonstrates an understanding of research terminology	19
17. Has a knowledge of the types of variables that must be dealt with in a basic experimental design	19
44. Understands the meaning of correlation	19
62. Can describe the threats to internal validity	19
65. Can describe the threats to external validity	19
66. Has an understanding of validity and the various types of validity	19
4. Knows how to operationalize variables	18

(cont.)

Table 1. (Continued)

Original Item Number	Total N = 21 Tally
21. Can identify situations in which the Ex Post Facto approach would be appropriate	18
24. Has a familiarity with the various types of Descriptive Research Methods	18
35. Is familiar with measures of central tendency and knows when it is appropriate to use each	18
8. Can conduct a review of related literature	17
14. Can formulate a testable hypothesis	17
18. Understands and can explain differences between true experiments and quasi-experiments	17
38. Has an understanding of variability in a distribution	17
40. Has an understanding of the standard deviation	17
54. Has an understanding of the t-test	17
67. Has an understanding of reliability and how it can be determined	17
69. Knows the various components of a research proposal	17
23. Knows the difference between primary and secondary sources	16
53. Has an understanding of and can interpret levels of significance	16
93. Can identify the type (method) of research represented by a particular study (experimental, etc.)	16
98. Understands the nature of causation and causal linkages	16
75. Can interpret charts and graphs	14
74. Has become a more critical listener	13
94. Can interpret bias in design and testing	13
57. Has an understanding of the F-ratio	11

understanding the concepts of internal and external validity. Further, it can be seen that the other 33 of the "Essential" group lean heavily toward other skills and knowledge areas that consumers of research must possess: reading journal articles with understanding; knowing what constitutes research; understanding what problems and/or questions are researchable; knowing what experimental, ex post facto, discriptive, and historical research approaches involve with regard to such items as research terminology, types of variables that must be dealt with, validity and threats to it; and having a familiarity with some of the very basic statistical procedures for data analysis, such as measures of central tendency and variability, correlation, t-test, and F-ratio.

It should also be noted that of these 38 skills and knowledge areas all came from the original list as suggested by alumni and textbook authors except numbers 93, 94, and 98 which were added to the list by panel members and which overlap to some extent with numbers 16, 62, and 21 of the original list.

In Table 2 eight skills and knowledge areas are presented which carry a near consensus in either the "Essential" or "Important" categories. When the tallies are combined for both "Essential" and "Important" a 75 percent majority (16 or more) is achieved. These eight carry a somewhat notable position in that although they do not quite achieve the "Essential" level they nonetheless carry a distinction that is higher in rank than "Important" alone.

As in Table 1 there is some overlapping which can be seen without stretching the imagination. Item 52, having to do with the concept of

Table 2. Rank Ordered Skills/Knowledge Areas Deemed ESSENTIAL/IMPORTANT by Experts--Composite Category with Near Consensus in One or Both (Consensus = Majority of at least 16 across the two categories)

Original Item Number	Total N = 21	(E +I)*Tally
52.	Has an understanding of the concept of Type I and Type II errors	(9+9) 18
59.	Has an understanding of the Chi-Square Test of Independence	(10+8) 18
9.	Has familiarity with the Current Index of Journals in Education	(9+8) 17
29.	Knows how to select a random sample	(10+7) 17
70.	Can actually write a research proposal including an organized review of related literature	(7+9) 16
79.	Appreciates the underlying assumptions/rationale of qualitative and quantitative methodologies	(6+10) 16
105.	Is familiar with basic research resources such as Psychological Abstracts, Sociological Abstracts, Social Sciences Citation Index, & Education Index	(7+9) 16
107.	Understands the logic underlying hypothesis testing	(8+8) 16

* E = Essential I = Important

Type I and Type II errors is related to Item 53 in Table 1 which involves intepreting significance levels. Normally, consideration of committing a Type I or Type II error is made before a confidence or significance level is set.

Item 59 involving chi square is not too far afield from several other basic statistical procedures mentioned as "Essential" in Table 1, notably numbers 35, 44, 54, and 57. Also, number 107 in Table 2 and number 14 in Table 1 both concern hypothesis formulation and testing.

Since there is an overlap of 6 of the 8 items in Table 2 (numbers 52, 59, 9, 70, 105, and 107) with 8 of those appearing in Table 1 (numbers 53, 35, 44, 54, 59, 8, 69, and 14), one wonders why the panel members did not rate those 6 as "Essential" also.

Those skills and knowledge areas deemed "Important" by the panel and for which a consensus was reached appear in Table 3. Of the 13 items, 7 were those added by panel members after Round I. Although some overlapping does occur between Table 3 and Tables 1 and 2, most of the items identify specifics not already mentioned. Because three received a 50 percent majority, 8 received a majority position between 62 and 74 percent, and 2 received positions above 75 percent, they certainly deserve to be considered as desirable.

Table 3. Rank Ordered Skills and Knowledge Areas Deemed IMPORTANT by Experts (Consensus = Majority of at least 11 within the Important category)

Original Item Number	Total N = 21	Tally
7.	Can converse confidently with others about the research process	19
28.	Can identify weaknesses in opinionnaire statements	17
10.	Can use the Thesaurus of ERIC Descriptors	15
15.	Understands the meaning of the null hypothesis and why it is written thus	15
19.	Has a knowledge of the various sampling procedures	13
101.	Understands importance of research replication	13
104.	Is familiar with basic research resources such as Encyclopedia of Educ. Research, Review of Educ. Research, Review of Research in Educ., and Handbook of Research on Teaching	13
12.	Is familiar with the use of the Mental Measurements Yearbook	12
102.	Understands the role of research in improving educational practice	12
109.	Can discuss why numerical analysis is useful	12
97.	Can distinguish between a single-variable group design and a factorial design	11
99.	Understands problems of direction of causality in correlational research	11
100.	Understands the various methods for summarizing different research studies on the same problem, especially the method of meta-analysis	11

Combining Tables 1, 2, and 3 produced a total of 59 skills and knowledge areas identified as "Desirable Skills and Knowledge Outcomes for an Introductory Educational Research Course." This represents 52 percent of the total 114 items in the study. Of this 59, 46 (78%) came from the original list of 77 established by alumni and textbook authors. The other 13 added by panel members represents 22 percent.

The 5 items listed in Table 4 as "Important/Useful" are clouded by the fact that nearly equal numbers of panel members rated them "Useful" as did those who felt they were "Important." Because they did not receive a consensus, they were omitted from the list of desirable skills and knowledge areas.

Thirty-six (32%) of the 114 items were designated by the panel as "Useful." These appear in Table 5. Those five with numbers higher than 77 were added by panel members to the original list. While Table 5 shows that all 36 items received a consensus, it is not felt that these warrant inclusion in the list considered to be "desirable." This also is true of those 10 items in Table 6 for which no consensus was reached. For these items, panel members' defenses were included in the table. Finally, one item appears in Table 7 for which were was a consensus that it was "unimportant."

Table 4. Rank Ordered Skills/Knowledge Areas Deemed IMPORTANT/USEFUL by Experts--Composite Category with Near Consensus in One or Both (Consensus = Majority of at least 16 across the two categories)

Original Item Number	Total N = 21	(I+US)*Tally
22.	Knows when to use the Historical Method	(10 +9) 19
106.	Has an understanding of the steps required to develop a test (vs. questionnaire) for use in research	(9 +9) 18
55.	Can calculate from a small group of scores the t-ratio for an independent sample	(8 +8) 16
56.	Can calculate from a small group of scores the t-ratio for a non-independent sample	(8 +8) 16
82.	Has an understanding of ethnography and naturalistic inquiry	(6 +10) 16

* I = Important US = Useful

Table 5. Rank Ordered Skills and Knowledge Areas Deemed USEFUL by Experts (Consensus = Majority of at least 11 within the Useful category)

Original Item Number	Total N = 21	Tally
26.	Knows the essential features of a cover letter to be used in a questionnaire study	20
31.	Is familiar with procedures to use to increase the rate of return for mailed questionnaires and opinionnaires	20
27.	Knows how to conduct a follow-up for a mailed questionnaire study	19
77.	Can enter data in a microcomputer program and interpret results	19
45.	Can calculate a correlation coefficient using the Pearson r	18
25.	Can construct questionnaires and opinionnaires	17
30.	Is familiar with stratified and cluster samples	17
50.	Knows how to predict Y scores from X scores using the scattergram and regression line	17
76.	Can interpret basic computer printouts	17
33.	Can draw a frequency polygon from a frequency distribution	16
37.	Can calculate the median from ungrouped data and from a frequency distribution	16
34.	Has an understanding of skewness	15
36a.	Can calculate the mean from ungrouped data	15
36b.	Can calculate the mean from a frequency distribution	15
42.	Can convert raw scores to standard Z-scores and T-scores	15
43.	Can convert raw scores to percentiles and stanines	15
48.	Can construct a scattergram	15
49.	Knows how to establish a regression line in a scattergram	15
51.	Knows how to use the Standard Error of Estimate	15

(cont.)

Table 5. (Continued)

Original Item Number	Total N = 21 Tally
58. Can compute an F-ratio (simple Analysis of Variance) from samples of data	15
108. Can select a systematic sample	15
20. Can use a table of random numbers	14
32. Can organize a set of data into a frequency distribution	14
41a. Can calculate the standard deviation from ungrouped data	14
41b. Can calculate the standard deviation from grouped data	14
96. Can interpret multiple regression, analysis of covariance, factorial designs, etc.	14
11. Is familiar with the Monthly Catalog of U. S. Government Publications	13
46. Can calculate a Spearman Rank-Difference correlation	13
47b. Knows when it is appropriate to use the Spearman rho	13
60. Can calculate the chi-square from two sets of frequencies	13
47a. Knows when it is appropriate to use the Pearson r	12
88. Knows the strengths/limitations of journalistic inquiry	12
39. Can calculate the quartile deviation	11
68b. Can calculate the Standard Error of Measurement	11
92. Has some minimal knowledge of single-subject experimental designs	11
95. Understands logic of analyzing variance in whatever form (ANOVA, r, R, ANCOVA, etc.)	11

Table 6. Skills and Knowledge Areas on Which NO CONSENSUS Was Reached

Original Item Number	Tally by Categories* E	I	US	UN	Item #	Defenses Stated for Positions**
68a. Has understanding of the Standard Error of Measurement	6	8	5	2	68a.	a. Not key to this course. b. This is important in only positivistic, quantitative inquiry--a small part of science only. c. Essential in meas. course. Everything cannot be taught in a semester.
78. Understands the nature of objectivity/reality and its philosophical base	3	8	5	5	78.	a. What the heck does this mean? b. Redundant with #2. [See Appendix C] c. Has meaning only in the positivist paradigm.
80. Understands how quantitative and qualitative research differ in philosophy and methodology	8	6	6	1	80.	a. Define philosophy. b. A dysfunctional debate. c. Drop in light of suggested change in #79 to replace "appreciates" with "understands." [#79 appears in Appendix D and Table 2.]
81. Understands the characteristics of good qualitative research	10	5	6	0	81.	a. Too specific for a general course. b. It's a fad right now. It will take its rightful place in time. But every quantitative methodologist ought to understand qualitative methods and use them to supplement quantitative.
84. Understands the differences between a scientific research report and a case study	6	6	2	3*	84.	a. One panel member abstained and added, "loaded statement. Implies case study is not scientific." b. Another panel member abstained & added, "Biased statement." c. Another abstainer said, "This implies that the two differ. I don't accept the premise." d. Does this mean a case study is not scientific? e. Abstainer: [a through d above are all] good comments.
85. Comprehends that scientific, technical knowledge in quantitative form is only <u>one</u> kind of useful knowledge	9	6	4	1*	85.	a. A panel member abstained and added, "Biased statement." b. I agree. c. Students in an introductory course should be exposed to all types of research in a general way.
86. Understands case study methods and procedures	4	7	8	1*	86.	a. Abstain--Prefer statement of items #78-82. [See Appendix D] b. Drop and use #79. c. Combine with #78-82.
87. Can read and evaluate a case study (as well as a scientific research report)	6	5	8	1*	87.	a. Abstain--Prefer statement of items #78-82. b. Redundant--case study is research. c. Combine with #78-82.
89. Has familiarity with phenomenological as well as positivistic inquiry and the basic assumptions of each	4	4	4	8*	89.	a. Abstain--See items #79 and #80. [See Appendix D] b. Same as # 79. c. Combine with #79-80.
90. Knows the strengths/limitations of phenomenology as a research method	5	0	8	7*	90.	a. Abstain--See item #81. [Above] b. Too specific--part of a separate course in evaluation. c. This is crucial in research.

(cont.)

Table 6. (Continued)

Original Item Number	Tally by Categories* E	I	US	UN	Item #	Defenses Stated for Positions**
91. Knows the difference between observation and inference and can demonstrate each	9	3	9	0	91.	[No defenses]
103. Understands what knowledge is and how findings become knowledge	4	3	7	2*	103.	a. Unclear. b. This question is extremely problematic—as you would know if you asked any feminist, critical theorist, neo-Marxian, etc. All of those persons would argue that "knowledge" is a socially constructed entity, usually defined by the dominant majority (in the case of the Western world, the majority is composed of white, middle-aged, middle-class male logical positivists). Thus, what constitutes "knowledge" depends on who you ask, and the historical, political, gender-based, and methodological frames which they bring to the consideration. >This question is extremely nebulous as written—and needs either to be >dropped, or reframed to read as stated in NEW ITEM 103 (See opposite). c. This [part b immediately above] is true. d. I like this [the alternate] better. I'll buy it.
>NEW ITEM 103 (suggested alternative wording): "Understands how knowledge is generally defined, and how various paradigms find it problematic, and understands the historical and political forces which bring about the translation of research "findings" into "knowledge."	4	2	0	0+		
110. Is familiar with Woodbury's A Guide to Sources of Educational Information	1	0	4	4++	110.	a. This item was added by one panel member during Round II, but most of the panel did not notice it (?)/respond to it during Round III. b. Same as items 9 & 10. [See Appendix C] c. Not known to me. d. I'll bet most people don't even know of this book which is the very best of the references to the educational literature available. If they remember only one reference guide, this is the one. From it they can find the other resources. Sorry I didn't add it in Round I.

+ Based on those 6 (of 21) panelists who responded to the new item. A majority remained with the item as originally worded. Some who responded indicated the original item was unclear. One panelist responded to both old and new items but added no comment or defense.

++ Based on 9 (of 21) panelists. A majority of the panel members failed to respond to the new final item added during Round II.

* E = Essential I = Important US = Useful UN = Unimportant
Some items total to fewer than 21 because of missing responses.

** Not all positions were defended.

Table 7. Knowledge Area Deemed UNIMPORTANT by Experts
(Consensus = majority of at least 11 within the Unimportant category)

Original Item Number	Total N = 21	Tally E	I	US	UN	Defenses for Minority Positions
83. Knows the components of connoisseurship and portraiture as methods of investigation		1	2	2	15	83. a. One abstainer asks, "What the hell is this?" b. Another panelist circles the abstainer's query. c. Abstainer's response in Round III: "And I still ask it!" d. RESPONSE from author of item: If he/she doesn't know this, the person is blind to ethnography/naturalistic research. e. Someone else: Too specific—part of a separate course in evaluation.

Thirty-five (92%) of the 38 items comprising the "Essential" scale were in the original "starter" list of 77 skills and knowledge areas submitted to the panel during Round I. From among the 37 items added to the list by individual panel members, three items failed consensus and were included in the final 38 items in the "Essential" category; 34 received no consensus. By contrast, only one percent of the items comprising Table 6--items on which no consensus was gained--was from the original list of 77 and it (#68a) resulted in a split by the panel into two parts of #68.

It is interesting to note in regard to item #68 that when split by the panel #68a, "Has an understanding of the Standard Error of Measurement" received no consensus in Table 6; however, #68b in Table 5, "Can calculate the Standard Error of Measurement" received a consensus of 11. It is odd that the panel could reach a consensus on the usefulness of the calculation of the statistic but could reach no consensus upon understanding it.

All 21 of the panelists are currently employed by colleges or universities and all have served as chairpersons or members on students' dissertation committees. In addition, 17 have served as advisors to students writing master's theses. These frequencies and others are displayed in Table 8 which also serves to display the format of the demographic questionnaire which accompanied Round III. Results of the open-ended questions concerning textbooks used in the introductory educational research course are reported in Appendix B.

Because of the small N of 21, many of the chi square analyses were confounded by the occurrence of cells with expected frequencies

of fewer than five. When Fisher's Exact Test was applied to the items (data from the demographic questionnaire, Table 8), about whether or not the panelist now teaches an introductory educational research course and whether that panelist views the course as an "only" course or as an introductory prerequisite to further study, the result was statistically significant (Fisher's Exact Test, $p = .023$); more panelists who teach the course now than would be expected by chance alone tend to view the course as an "only" course rather than as an introductory course prerequisite to further study.

Table 8. Demographic Frequencies Reported in the Format of the Questionnaire 27

Information Elicited

Please indicate the type of organization where you are currently employed.

21	(1) College or University		(5) Industry
	(2) School system		(6) Research/Development
	(3) State agency		(7) Other (Specify)
	(4) Federal agency		

Major responsibility in present position:

5	(1) Research		(7) Management/Administration of Research/Development
	(2) Evaluation		
	(3) Development	3	(8) Management/Administration of other than R & D
13	(4) Teaching		
	(5) Counseling		(9) Other (Specify)
	(6) Consulting		

Primary Discipline:

	(1) Anthropology	4	(7) Psychology
	(2) Economics		(8) Sociology
9	(3) Education	7	(9) Statistics, Mathematics, or Research Methodology
	(4) History		
	(5) Philosophy	1	(10) Other (Specify) Agricultural Education
	(6) Political Science		

Please check the statement which best reflects your perception of a one-semester course in research:

9 As an only course in research methodology on the master's degree level to produce a consumer of research

10 As an introductory course to be followed by a course in statistics or a statistics course taken concurrently--leading to a research study or a master's thesis

Do you feel this should be a two-semester course? NO--10 YES--10

If you teach the introductory course in educational research, what textbooks and/or supplements do you use? SEE APPENDIX B
If you do not teach the course yourself, what book(s) do your colleagues use?

In your particular setting (your college or university):

3 Do you look upon this course as a "terminal" course in research as in an M.A. program leading to the production of a thesis? OR

6 Do you look upon it as an introduction to statistics course and a Ph.D.? OR

7 Do you see it as a final and only course for consumers of research?

What (other) courses do you teach?

Are you involved in some aspect of teacher preparation? YES--5 If so, what?
NO--9

Do you currently teach a graduate introductory educational research course? YES 11 NO 9

If not currently teaching such a course, have you taught it within the past five years? YES 14 NO 6

Have you served as an advisor to students who write master's theses? YES 17 NO 4

Do you chair or have you served on students' dissertation committees? YES 21 NO

DISCUSSION

It is abundantly clear that those who adhere to the positivistic, quantitative orientation or paradigm remain in the majority in educational research. Many of the experts with that orientation, however, promote exposure of students in the introductory course to a wide methodological range of experiences. A significant number of those of the naturalistic, qualitative orientation are nonetheless represented among the membership of this elite panel of experts who were nominated from among the ranks of their peers. Some among them view their orientation as something of a revolution, while some among the former group view it as a current fad (see defenses to Item 81 in Table 6), but one which will assume "its rightful place" as a supplement to the quantitative approach. Others apparently see it as a nebulous subjective nonscientific hodgepodge. Reputations are sometimes forged by joining one camp or the other and stirring controversy. Clearly, there are some who lack the motivation, time, or temperament to sort out for others the constructs underlying concepts and terminologies--indeed to do so would probably earn or significantly enhance a reputation for someone (A dictionary of such terms does not seem to be readily available). It is not surprising that those whose orientation lies outside the "qualitative" paradigm have difficulty communicating with those on the inside, for indeed, those on the inside, apparently, have some difficulty among themselves as is evidenced by lack of agreement on the items in Table 6 where there remains a real task of sorting out and refining specific items. For example, the original Item 68 (see Appendix C) was split into

parts a and b by the panel; confounding through reduction into smaller parts is illustrated by the fact that Item 68b (Can calculate the Standard Error of Measurement) was categorized as "useful" and falls in Table 5 (by a bare majority), but no consensus was reached on Item 68 in Table 6a (Has understanding of the Standard Error of Measurement). Discretion must be used when interpreting at or near category cut-off points, apparently; however, a majority of 21 is 11. So perhaps calculation should precede understanding!?

The need for such clarification is further documented by publication of the lead article in the Summer, 1987, American Educational Research Journal entitled "Publishing Qualitative Research" (Smith, 1987). Elmore and Woehlke (1989) document the dearth of qualitative studies published in respected journals in the past decade. One can only speculate about the probability that some good qualitative studies have been summarily rejected for publication by some reviewers whose orientation lies in the opposite paradigm. One can hear echoes of questions like, "What was the hypothesis being tested?" "How can the results be generalized without a random sample?" "How was validity established for the instrument?" "How were the variables operationalized?"

On the other hand, however, throughout the three rounds of the Delphi study recognition has frequently been granted to the idea that there are many routes (methodologies) possible in the quest for knowledge, however that may be defined.

There is general agreement that although statistical concepts are "Useful," the introductory educational research course, when limited

to a one-semester time frame, is neither an introductory statistics course nor a course which equips one to be a producer who has the necessary methodological tools to carry out a research project. Other courses are needed--especially a concurrent or subsequent statistics course, and one panelist suggested, conversely, that a statistics course should be a prerequisite. In at least one panelist's higher education setting, the introductory educational research course is introduced more philosophically as exploration, with diverse selected readings, into the logic of inquiry and branches outward to inquiry in the social sciences via textbooks, taking as tools both qualitative and quantitative approaches--but excluding statistical computation skills at the level of this course.

The present Delphi researchers do not suffer from the delusion that an all-encompassing, conclusive core list of essential or desirable skills and knowledge areas for the course has been generated. Additional rounds of iteration (with already busy but generous panel members) are neither feasible nor expected. Perhaps a study with a similar instrument but a different design is in order so the list can be further refined.

Generalizations from this study, however, even at this stage, can be widespread nationally to all colleges and universities that offer a graduate introductory course in educational research. It can be helpful to departments as they develop or revise their research curricula. Also, there could be a common base of skills and knowledge that transfer students could be expected to possess. It could help to pinpoint sections of current textbooks that need to be emphasized as

well as help form a perspective for anticipated introductory texts. Further, the study anticipates ways in which research skills and knowledge could be put into practice in education as well as in other professional fields. Hopefully this study, in presenting a somewhat comprehensive list of skills and knowledge areas, will be identified particularly by people in education--elementary, secondary, and higher education teachers--as skills that they can put into practice as they teach their subject matter content; it is hoped that this study will help some to become conscious of the need to make useful application of what they have learned from their introductory educational research course and have gleaned from the professional literature in their fields.

It must be remembered that despite the known and acknowledged fact that the course varies according to context or setting as well as according to individual instructor (and always will), the purpose of this study was to establish some commonalities across settings of those skills and knowledge areas which comprise something of a "core" for the content of an introductory educational research course. To that end the study results satisfy the stated purpose.

However, it is interesting as well as ironic that Item 83 (Knows the components of connoisseurship and portraiture as methods of investigation)--the only item that gained a consensus as being unimportant--stands alone in light of the fact that the results of this Delphi study, in some ways, exemplify a form of connoisseurship (Eisner, 1976). The panel, composed of the experts in educational research who were nominated by experts in the AERA Special Interest

Group: Professors of Educational Research, represents those who are informed about the qualities inherent in good research, who are able to discriminate subtleties among those qualities, and who possess awarness and understanding of the process to the end-product and beyond. Connoisseurship implies a transcendence beyond scientific method, an appreciation—perhaps to a level akin to art, not unlike that of the expert wine taster.

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Appendix A

The following is an alphabetically arranged list of the twenty-one members of the Delphi panel:

Donald Ary

David Berliner

Walter R. Borg

Patricia Busk

S. Alan Cohen

Patricia B. Elmore

Meredith D. Gall

L. R. Gay

Gene Glass

Kenneth D. Hopkins

Robert B. Ingle

David Krathwohl

Yvonna Lincoln

Barbara S. Plake

W. Todd Rogers

Robert Slavin

James Stone

Bruce Tuckman

Herbert J. Walberg

J. Robert Warmbrod

Paula Woehlke

Appendix B

For those panelists who teach an introductory educational research course themselves, the following textbooks were mentioned as the ones they use in the course:

Times Mentioned	
2	Ary, D., Jacobs, L. C., & Razavieh, A. (1985). Introduction to research in education (3rd ed.). New York: Holt, Rinehart, & Winston.
5	Borg, W. , & Gall, M. D. (1983). Educational research: An introduction (4th ed.). New York: Longman.
1	Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Boston, MA: Houghton Mifflin Company.
1	Cohen, S. A. (1989). The big R: How to do research in education, psychology and nursing. Novato, CA: Mastery Learning Systems.
1	Dallmayr, F. A., & McCarthy, T. A. (1977). Understanding the social inquiry. Notre Dame, IN: Notre Dame University Press.
1	Gay, L. R. (1987). Educational research (3rd ed.). Columbus, OH: Charles E. Merrill Publishing Company.
1	Moore, G. W. (1983). Developing and evaluating educational research. Glenview, IL: Scott Foresman.
1	Rabinow, P., & Sullivan, W. M. (1988). Interpretive social science: A second look. Berkeley, CA: The University of California Press.
2	Smith, M. L., & Glass, G. V. (1987). Research and evaluation in education and the social sciences. Englewood Cliffs, NJ: Prentice-Hall, Inc.
1	Tuckman, B. W. (1988). Conducting educational research (3rd ed.). New York: Harcourt Brace Jovanovich

For those panelists who do not teach the course themselves, the following books were mentioned as being used by colleagues:

Times Mentioned	
2	Borg, W. , & Gall, M. D. (1983). Educational research: An introduction (4th ed.). New York: Longman.
1	Best, J. W., & Kahn, J. V. (1989). Research in education (6th ed.). Englewood Cliffs, NJ: Prentice-Hall, Inc.
1	Gay, L. R. (1987). Educational research (3rd ed.). Columbus, OH: Charles E. Merrill Publishing Company.
1	Kerlinger, F. N. (1986). Foundations of behavioral research (3rd ed.). New York: Holt, Rinehart and Winston.

Appendix C

SKILLS AND KNOWLEDGE AREAS
Checklist: Round I

Please furnish both office and home addresses and phone numbers.

Name: _____

Office Address & Phone Number: _____

_____ ( )

Home Address & Phone Number: _____

_____ ( )

Please check the appropriate column by indicating whether you consider the skill or knowledge area "Essential," "Important," "Useful," or "Unimportant" for a one-semester, graduate, introductory course in Educational Research. On the last page please write any essential skills or knowledge areas that you feel have been omitted from the list.

The following definitions are provided in order to gain uniformity in the decision process:

Essential - Without this skill or knowledge an individual cannot be considered to have learned enough about the educational research process to be a consumer and/or producer of research.

Important - An individual should possess this skill or knowledge in order to evaluate the research of others. It should be given emphasis in an introductory research course.

Useful - A skill or knowledge area that would be "nice" to know. If time permits, it could be included in the course but normally would be given little emphasis.

Unimportant - This skill or knowledge is not necessary for an individual to be a consumer or producer of research.

Skills and Knowledge Areas Checklist: Round I	Essential	Important	Useful	Unimportant
1. Understands what constitutes research				
2. Understands what a scientific study involves				
3. Can state a problem or question in such a way that it is amenable to the research process				

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Appendix C (Continued)

	Essential	Important	Useful	Unimportant
4. Knows how to operationalize variables				
5. Can identify questions or problem statements that do do not lend themselves to the scientific method of analysis.				
6. Demonstrates an understanding of research terminology				
7. Can converse confidently with others about the research process				
8. Can conduct a review of related literature				
9. Has familiarity with the CURRENT INDEX OF JOURNALS IN EDUCATION				
10. Can use the THESAURUS OF ERIC DESCRIPTORS				
11. Is familiar with the MONTHLY CATALOG OF U.S. GOVERNMENT PUBLICATIONS				
12. Is familiar with the use of the MENTAL MEASUREMENTS YEARBOOKS				
13. Can read journal articles and research reports with understanding				
14. Can formulate a testable hypothesis				
15. Understands the meaning of the null hypothesis and why it is written thus				
16. Understands what is involved in the Experimental Method of solving a research problem				
17. Has a knowledge of the types of variables that must be dealt with in a basic experimental design				
18. Understands and can explain differences between true experiments and quasi-experiments				
19. Has a knowledge of the various sampling procedures				
20. Can use a table of random numbers				
21. Can identify situations in which the Ex Post Facto approach would be appropriate				
22. Knows when to use the Historical Method				
23. Knows the difference between primary and secondary sources				

Appendix C (Continued)

		Essential	Important	Useful	Unimportant
24.	Has a familiarity with the various types of Descriptive Research Methods				
25.	Can construct questionnaires and opinionnaires				
26.	Knows the essential features of a cover letter to be used in a questionnaire study				
27.	Knows how to conduct a follow-up for a mailed questionnaire study				
28.	Can identify weaknesses in opinionnaire statements				
29.	Knows how to select a random sample				
30.	Is familiar with stratified and cluster samples				
31.	Is familiar with procedures to use to increase the rate of return for mailed questionnaires and opinionnaires				
32.	Can organize a set of data into a frequency distribution				
33.	Can draw a frequency polygon from a frequency distribution				
34.	Has an understanding of skewness				
35.	Is familiar with measures of central tendency and knows when it is appropriate to use each				
36.	Can calculate the mean from ungrouped data and from a frequency distribution				
37.	Can calculate the median from ungrouped data and from a frequency distribution				
38.	Has an understanding of variability in a distribution				
39.	Can calculate the quartile deviation				
40.	Has an understanding of the standard deviation				
41.	Can calculate the standard deviation from grouped and ungrouped data				
42.	Can convert raw scores to standard z-scores and T-scores				
43.	Can convert raw scores to percentiles and stanines				
44.	Understands the meaning of correlation				

		Essential	Important	Useful	Unimportant
45.	Can calculate a correlation coefficient using the Pearson r				
46.	Can calculate a Spearman Rank-Difference correlation				
47.	Knows when it is appropriate to use the Pearson r and the Spearman rho				
48.	Can construct a scattergram				
49.	Knows how to establish a regression line in a scattergram				
50.	Knows how to predict Y scores from X scores using the scattergram and regression line				
51.	Knows how to use the Standard Error of Estimate				
52.	Has an understanding of the concept of Type I and Type II errors				
53.	Has an understanding of and can interpret levels of significance				
54.	Has an understanding of the t-test				
55.	Can calculate from a small group of scores the t-ratio for an independent sample				
56.	Can calculate from a small group of scores the t-ratio for a non-independent sample				
57.	Has an understanding of the F-ratio				
58.	Can compute an F-ratio (simple Analysis of Variance) from samples of data				
59.	Has an understanding of the Chi-Square Test of Independence				
60.	Can calculate the chi-square from two sets of frequencies				
61.	Understands the concept of internal validity				
62.	Can describe the threats to internal validity				
63.	Has an understanding of how design arrangements can reduce threats to internal validity				
64.	Understands the concept of external validity				
65.	Can describe the threats to external validity				

		Essential	Important	Useful	Unimportant
66.	Has an understanding of validity and the various types of validity				
67.	Has an understanding of reliability and how it can be determined				
68.	Has an understanding of the Standard Error of Measurement and can calculate it				
69.	Knows the various components of a research proposal				
70.	Can actually write a research proposal including an organized review of related literature				
71.	Has an understanding of the basic ethical and legal considerations in conducting research				
72.	Has developed a familiarity with research-oriented periodicals in his/her own field or area of interest				
73.	Can critically evaluate a research report				
74.	Has become a more critical listener				
75.	Can interpret charts and graphs				
76.	Can interpret basic computer printouts				
77.	Can enter data in a microcomputer program and interpret results				

Please write below any skills or knowledge areas that you feel are essential and have been omitted from the above list.

PANEL MEMBERS ADDED THE FOLLOWING ITEMS DURING/AFTER ROUND I:

78. Understands the nature of objectivity/reality and its philosophical base

79. Appreciates the underlying assumptions/rationale of qualitative and quantitative methodologies

80. Understands how quantitative and qualitative research differ in philosophy and methodology

81. Understands the characteristics of good qualitative research

82. Has an understanding of ethnography and naturalistic inquiry

83. Knows the components of connoisseurship and portraiture as methods of investigation

84. Understands the differences between a scientific research report and a case study

85. Comprehends that scientific, technical knowledge in quantitative form is only one kind of useful knowledge

86. Understands case study methods and procedures

87. Can read and evaluate a case study (as well as a scientific research report)

88. Knows the strengths/limitations of journalistic inquiry

89. Has familiarity with phenomenological as well as positivistic inquiry and the basic assumptions of each

90. Knows the strengths/limitations of phenomenology as a research method

91. Knows the difference between observation and inference and can demonstrate each

92. Has some minimal knowledge of single-subject experimental designs

93. Can identify the type (method) of research represented by a particular study (experimental, etc.)

94. Can interpret bias in design and testing

95. Understands logic of analyzing variance in whatever form (ANOVA, r, R, ANCOVA, etc.)

96. Can interpret multiple regression, analysis of covariance, factorial designs, etc.

(cont.)

97. Can distinguish between a single-variable group design and a factorial design

98. Understands the nature of causation and causal linkages

99. Understands problems of direction of causality in correlational research

100. Understands the various methods for summarizing different research studies on the same problem, especially the method of meta-analysis

101. Understands importance of research replication

102. Understands the role of research in improving educational practice

103. Understands what knowledge is and how findings become knowledge

NEW ITEM 103 AS SUGGESTED:
"Understands how knowledge is generally defined, and how various paradigms find it problematic, and understands the historical and political forces which bring about the translation of research "findings" into "knowledge."

104. Is familiar with basic research resources such as Encyclopedia of Educ. Research, Review of Educ. Research, Review of Research in Educ., and Handbook of Research on Teaching

105. Is familiar with basic research resources such as Psychological Abstracts, Sociological Abstracts, Social Sciences Citation Index, & Education Index

106. Has an understanding of the steps required to develop a test (vs. questionnaire) for use in research

107. Understands the logic underlying hypothesis testing

108. Can select a systematic sample

109. Can discuss why numerical analysis is useful

110. Is familiar with Woodbury's A Guide to Sources of Educational Information

THE FOLLOWING ITEMS WERE ADDED AS A RESULT OF PANEL MEMBERS' SPLITTING OF ITEMS FROM THE "STARTER" LIST OF 77 ITEMS (see Appendix C):

36b. Can calculate the mean from a frequency distribution

41b. Can calculate the standard deviation from grouped data

47b. Knows when it is appropriate to use the Spearman rho

68b. Can calculate the Standard Error of Measurement